BIO-PETROL SYNTHESIZED FROM RUBBER SEED OIL EXTRACTED FROM RUBBER SEEDS THROUGH HETEROGENEOUS CATALYTIC CRACKING USING MONTMORILLONITE

CHEOW YIN SAN

A thesis submitted in fulfillment of the
requirements for the award of the Degree of
Bachelor of Chemical Engineering

Faculty of Chemical and Natural Resources Engineering
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ABSTRACT

Currently, most of the bio-petrol is produced from the refined or edible type oils such as the utilization of palm oil for the production of more environmental friendly bio-fuels. However, synthesizing Isooctane from rubber seed oil (RSO) extracted from rubber seeds is more favorable as RSO contains more fatty acid to be produced into bio-petrol. The rubber seeds are readily available, cheap and help to improve the socioeconomic issues. The RSO is extracted from rubber seeds using the Soxhlet Extractor with hexane as solvent. The catalytic cracking of the mixture of 0.1L of RSO and 20g of Montmorillonite catalyst at 98^0C for 2 hours is to boost up the rate of reaction of breaking the long chains of fatty acids. The presence of Isooctane in a sample is detected using Gas Chromatogram. Chromatograms for standards of different ratio mixtures of hexane and Isooctane are to plot a calibration curve from which the Isooctane produced can be determined. The high actual concentration of Isooctane in samples could be explained using the cause of catalyst structure, various types of fatty acid mixture present in RSO and the contamination in RSO. The mass of catalyst and volume of RSO used will affect the percentage of concentration of Isooctane in samples. As a conclusion, Bio-petrol can be produced from RSO based on the presence of Isooctane using Montmorillonite catalyst in the catalytic cracking process. This research can be further improved by chromatogram modification, use fresh rubber seeds for extraction, elimination of impurities and minimization of human errors.

Keywords: RSO, Soxhlet Extraction, Catalytic Cracking, Montmorillonite, GC, Isooctane

ABSTRAK

Pada masa kini, banyak jenis biopetrol dihasilkan daripada minyak masak seperti penggunaan minyak kelapa sawit untuk menghasilkan biopetrol yang lebih mesra alam. Namun, Isooktana yang disintesiskan daripada minyak biji getah (RSO) dari pengekstrakkan biji getah lebih baik kerana RSO mengandungi lebih banyak asid lemak untuk dihasilkan kepada biopetrol. Biji getah mudah didapati dengan harga murah dan dapat membantu dalam pembangunan ekonomi negara. RSO diekstrak dengan alat Soxhlet Ekstrak dengan heksana sebagai pelarut. Kaedah penguraian bermangkin untuk campuran 0.1L RSO dan 20g pemangkin Montmorillonite pada pemanasan hingga 98^0C selama 2jam adalah untuk mempercepatkan kadar tindak balas kimia pembentukkan Isooktana dari asid lemak. Kehadiran Isooktana dalam sampel dibuktikan dengan alat Gas Kromatografi. Kromatogram piawai sampel dengan nisbah campuran Isooktana dan heksana yang berbeza dalam penghasilan satu piawai graf untuk menentukan kehadiran kepekatan Isooktana dalam sampel. Data menunjukkan nilai kepekatan Isooktana yang sangat besar dan ini boleh diulas dengan punca akibat daripada struktur pemangkin, campuran jenis asid lemak dalam RSO dan pencemaran RSO. Jumlah pemangkin dan isipadu RSO yang digunakan dalam penyelidikan ini akan mempengaruhi kepekatan Isooktana yang sebenar di dalam sampel. Akhir kata, biopetrol dapat dihasilkan daripada RSO dengan adanya kehadiran Isooktana dalam RSO dengan menggunakan pemangkin Montmorillonite dalam proses penguraian bermangkin. Penyelidikan ini boleh diperbaiki dengan pengubahan pada paksi chromatogram, penggunaan biji getah yang segar dan mengurangkan kesan akibat dari kecuaian sikap manusia serta kehadiran kotoran pada bahan yang digunakan.

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LIST OF SYMBOLS

$	-	Dollar sign that indicates dollar units of currency
%	-	percentage
°C	-	Degree Celsius
^{0}F	-	Degree Fahrenheit
m^3	-	Cubic meter
n	-	Number of moles
<	-	Less than
>	-	More than
mmHg	-	Millimeters of Mercury
ρ	-	Density

LIST OF ABBREVIATIONS

RM	-	Ringgit Malaysia
RON	-	Research Octane Number
min	-	minute
nm	-	nanometer
C	-	Carbon
H	-	Hydrogen
CO_2	-	Carbon Dioxide
SO_2	-	Sulphur Dioxide
NO_x	-	Nitrogen oxide
SiO_2	-	Silica

LIST OF APPENDICES

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DECLARATION

I declare that this thesis entitled *"Bio-petrol synthesized from Rubber Seed Oil extracted from Rubber Seeds through Heterogeneous Catalytic Cracking using Montmorillonite"* is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : .....

Name : CHEOW YIN SAN

Date : 29th NOVEMBER 2010

DEDICATION

Dedicated to the memory of

My beloved parents and siblings,

My supervisor and lecturers,

And all supportive friends

ACKNOWLEDGEMENT

When I first started on this research since last semester, I totally had no idea of just how many people I would rely upon to complete it. This thesis is the outcome result of the extensive contribution from a number of individuals whom I would want to thank to. To God, I am very grateful for giving me a good health and strength to finish this thesis due to its dateline. I want to express my deepest gratitude to my Projek Sarjana Muda (PSM) supervisor, Mr. Syaiful Nizam Hassan for constantly guiding and encouraging me throughout this completion of thesis, his willingness to spend time, to share his knowledge and thoughts, and the effort to monitor the progress of my research starting from the beginning phase to its completion. Without him, by now I would still be in a very unclear state of mind as he did explained everything in detail without hesitation. He welcomed his students to look for him anytime even when he is not free actually.

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